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SIGMA XI QUARTERLY

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SIGMA XI QUARTERLY

EDITORIAL COMMITTEE

Floyd Karker Richtmyer Edwin Emery Slosson
Henry Baldwin Ward

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NEW WORK FOR SIGMA XI

The semi-annual meeting of the Executive Committee was held in Chicago on May 4 as announced. The minutes of that meeting with an extended abstract of the discussions will be the leading article in the September QUARTERLY. One or two features of the occasion may be briefly noted here.

Coming as this meeting did at a moment of grave importance in national history, it was natural that the future of the Society and its specific relation to the needs of the country should be the foremost topic for consideration. There are not wanting those who have urged that the Society disband and that all the energy of individual members be directed to the support of the Government at the particular point for which the individual seemed best qualified. To the great majority, however, this has not seemed the correct view. The country needs now as never before an emphasis upon research and the fullest utilization of existing organizations for the encouragement and development of investigation.

A number of prominent items received attention at that time, showing possibilities as yet undeveloped, but offering opportunities for the work and influence of Sigma Xi which should make the organization of real service to the Nation.

First and foremost of these may be placed the proposal of President Stieglitz fully outlined in the leading paper of this number. All who had heard of this plan were impressed with its value. While

there are difficulties in the way of its realization, they should not deter us from the effort in view of the tremendous influence which would be exerted through the amalgamation of all the alumni with the active members of the Society into a single working unit. In such an event, the QUARTERLY would acquire increased importance as the agent of communication. It is to be hoped that members will study carefully the outline of Professor Stieglitz' plan and offer suggestions for the modification and extension of the scheme, as well as express their views on the general advisability of the plan.

Of almost equal importance with the last item was the decision of the Executive Committee to tender the services of the Society and its journal to the National Research Council. Readers of the QUARTERLY are well acquainted with the details concerning the organization of this splendid movement under the direction of its distinguished chairman, Dr. George E. Hale, and with the various subordinate committees and collaborators which it has brought into the work. It is yet too early to venture any suggestion as to the exact manner in which assistance can be given, but all will recognize the appropriateness of such an arrangement and will approve the action of the Executive Committee in placing the resources of the Society unreservedly at the disposal of the National Research Council.

The research men of the country are to be recruited from the college students of today. They will determine our ability as a nation to meet the demands of the future for fuller existence thru more perfect knowledge of the powers and processes of mind and matter. What is your chapter doing to interest men in the opportunities that research offers?

SIGMA XI'S OPPORTUNITY

JULIUS STIEGLITZ

Our Society was founded to promote and encourage research. Up to the present time it has done this almost exclusively in three ways: It has fostered stimulating companionship among all investigators at institutions at which its chapters have been located. Then, by election into the Society, it has encouraged students of promise, graduate and undergraduate, to devote their lives to research. Finally, usually through the efforts of members of older chapters, it has extended its influence by inaugurating new chapters in more and more institutions, which have been deeply imbued with the spirit of research and which have provided research facilities at least for a number of strong departments. In all of these ways the Sigma Xi Society has unquestionably done excellent service, often pioneer service indeed, in the cause of research. But has Sigma Xi done all it could do? Is it doing all it could and should do, even easily, now?

The thirty and odd years of the life of the Society have been coeval with a tremendous awakening and growth of research power in our country. This has been evident not only in the rapid and healthy growth of strong graduate schools in many of our universities and in the founding of powerful research institutions on private foundations, but it has been apparent to an equal degree also in the great development of research in our government bureaus and in great laboratories in the industries, established for the purposes of original investigation. In this vigorous growth of research activities and interest, results under our Michelsons, Richards, Flexners, Hales, Chamberlins, Carrels, Loebs, Cartys, Pupins, Millikans, and others, have made us, with the rest of the scientific world, justly proud. But there has developed one serious defect, growing more obvious now, to which thought has been given in recent times and to which I wish to call the attention of the Sigma Xi Society as to a valuable opportunity for fulfilling its mission of promoting research, an opportunity to do this directly, in a way it has never attempted before but which nevertheless holds out promise of important results. To any one of us who may be engaged in graduate schools in training research men and giving them the doctorate of philosophy in recognition of their proved power of carry-

ing out investigations, or to any engaged in training engineers or in preparing men for graduate work, the survey of the work of the last twenty years must bring a feeling of deep disappointment at the fact that, after all, so large a proportion of our doctors of philosophy, of our engineers, and of our promising college boys have proved and are proving sterile in research after they have left the protection of our schools to develop their own professional careers. That a certain proportion of men should thus be lost to research is unavoidable, but the loss is unduly great and each of us knows that it includes men of unquestionably high ability, of great critical powers and fertility of the scientific imagination. Since this is the very type of man who gives promise of leadership and since, after all, science moves ahead under great leaders in whose path followers swarm to elaborate and complete their work, the loss of this type of man in the aggregate is a very serious one. Recently the chairman of the National Research Council, Dr. George Hale, with his customary keenness of vision, has recognized this wastage and has made a recommendation, the carrying out of which could go a long way toward saving these men of a high order of ability for the cause of research. We all know but too well that the interest and enthusiasm of doctors of philosophy and of other research students is most commonly weakened and finally stifled because their time and strength are fully consumed in routine work in colleges, universities, or the industries. Efforts to bring about a radical cure of this evil are not wanting—for instance, the American Association of University Professors is studying the problem—but improvement in this direction must be very slow because of the large amounts of capital endowment involved in any decided steps to improve the situation within the institutions themselves. A quicker, more immediate way of saving the most promising and able of these young investigators has been pointed out by Doctor Hale, and that is to provide opportunities for them to continue in research after they have taken their doctorate degrees, without any hampering routine duties. Such opportunities can be best secured by the founding of fellowships with an income of say $1,000 a year, to which only doctors of philosophy or other men who have completed investigations would be eligible, best in a competitive way. Here is where Sigma Xi's opportunity lies—an opportunity, moreover, which it should seize not only for the sake of possible beneficiaries

but for its own good! Grown stronger and stronger in total membership in the thirty years of its life, our Society, it seems, has never realized this strength; certainly it has never attempted to use it! With over ten thousand alumni members, we have, with the exception of the alumni in Washington and of a few loose connections elsewhere, allowed the vast majority of our alumni to fall almost completely out of touch with us as an active Society; we have neither asked them to contribute to the working strength of the Society nor have we made any definite efforts to recognize the important place they should by all rights hold in the affairs of the Society. Here, again, is where Sigma Xi's present opportunity lies—to make at last our whole membership, active and alumni, a coherent body, coherent through a common *service*, the greatest of all amalgamating agencies.

At its recent session, the Executive Committee of the Society unanimously endorsed the plan to ask the next convention to authorize an appeal to our whole membership to found at least three Sigma Xi Fellowships with an income of $1,000, to be awarded annually on the basis of competitive effort to doctors of philosophy of recent graduation, and to engineers who had completed definite pieces of original work. Pending the approval of the convention for the general plan, no details have as yet been definitely elaborated, but it is our thought that we should have one Sigma Xi Fellowship in the Physical Sciences, one in the Biological Sciences, and one in Engineering (perhaps including mathematics) and Applied Science. Candidates would be required to submit reports on original investigation—doctors' theses and engineers' theses would be accepted—and the award of the fellowships would be left to three committees, selected by the Executive Committee, one in each of the three broad fields of research indicated above. Successful candidates would be required to continue work at investigation, but they would be quite free to work at any institution of their own choice and might well be encouraged to select a place other than their alma mater. Not only would the opportunity for continued work be invaluable in stimulating and strengthening the ardor for research, but the distinction of a national Sigma Xi Fellowship would be eagerly sought and would encourage and enhance the working power of a successful candidate. Let us recall that in Germany, where the development of scientific research has been

most extensively and perhaps most successfully promoted, the choice of young doctors of philosophy are encouraged to go on with their own researches with the object of obtaining (through the "Habilitationsarbeit") the right to lecture and to appointment to university chairs. Anyone familiar with the subject realizes that it is just from these *post doctorem* investigators that the leaders of the future are developed. Our fellowships and others of the same type to be founded in universities, will do much to develop the same opportunities here, in a way suitable for the conditions in our own country. Let Sigma Xi lead in this effort! The *leisure* for thought and growth for the young investigators is the invaluable feature of the whole plan!

Now, as to the financial side: It is proposed to appeal especially to our alumni members to guarantee a contribution of $1 per year for a period of five years for the establishment of the Sigma Xi Fellowships. Provision would be made that the whole amount subscribed, $5, could be contributed if desired, in one payment, the amount on balance being invested by the Society and drawn upon at the rate of $1 per year. It is expected that many alumni will be able to afford much larger contributions, the excess of which would be used for establishing a permanent endowment fund. Such alumni might well be recognized as "donors" as in other Societies. Active members are now assessed for the running expenses of the National Society and of the individual chapters, but quite a number of these members no doubt would be glad to contribute also to this worthy undertaking of the Society.

In this way, it is thought, the Sigma Xi Fellowships can be supported without being a burden upon individuals; *by the united strength* of the Society as a whole and this effort to act through its whole membership, this appeal to our alumni to lend their strength for the fulfillment, in a broader field, of the purposes for which the Society was founded, will, it is hoped, act as a leaven to amalgamate all parts of the Society into a united whole in a way that has never been realized in it before this. We trust it will lead to a condition of conscious power in the Society, found in its new unity and strength, that it will never wish to miss again. In many instances our alumni have suffered from the very conditions we are trying to remedy; they must realize the value of timely encouragement to young men of promise in the period of their greatest enthusiasm

for research. All of our members will be equally interested in watching the development and success of the Sigma Xi Fellows, men from among whom we shall see leaders in their fields of effort ultimately grow. That should be the watchword for our judges!

We are all aware that an appeal has been made to scientists and scientific societies to foster and develop in every way possible the resources of the country in research forces. It is my earnest hope that Sigma Xi Fellowships will be the signal contribution of the Sigma Xi Society to this worthy call!

THE SIGNIFICANCE AND CONDITIONS OF RESEARCH*

WILLIAM A. NOYES

We welcome you tonight to the brotherhood of those men and women to whom scientific research is an absorbing occupation. You enter this group at a time which is unique in the history of the world—at a time when the scientific forces of the whole world are being organized for the prosecution of war. War is no longer merely the business of the army and navy; it is something in which the whole nation must take part and each of us must do his share. For the time being many must give their energies to the practical problems of defense and offense. One of our greatest American physicists has been working over a new range finder for the use of the navy and army. A great chemist has given months to the study of the best method of converting nitrogen into the nitric acid required for explosives. Others are at work on the production of optical glass for field glasses and other instruments. Statesmen have discovered that men skilled in research are indispensible for the successful prosecution of the war. They are looking now for immediate practical results, but the basis on which such results must rest is research work which has been continued for a century past. Just now we are calling loudly for inventions, and the war will doubtless bring many of these; but we, at least, must not forget, as too many do forget, that discoveries in science are of vastly greater consequence than invention. Faraday discovered electrical and magnetic induction. Without his discovery Morse and others could not have invented the telegraph. Scientific research is concerned primarily in making discoveries which will increase our knowledge. Invention takes discoveries and applies them to practical uses. You have been chosen for membership in Sigma Xi because we believe that you are capable of making discoveries.

It is worth our while, perhaps, to consider how discoveries are made. There is a popular notion that great discoveries are largely accidental. There is a certain amount of truth in this view. Newton saw an apple fall and was led to the discovery of the laws of

*An address to the initiates of Illinois Chapter of Sigma Xi, May 30, 1917.

gravitation. But countless numbers of men had seen objects fall before Newton. It was only because his mind had been prepared by years of study that his attention was fixed by the observation. In a similar manner if we cultivate the habit of thinking about scientific problems suggestions will come to us from time to time which it is worth our while to follow. Suggestions which are really valuable come rarely; when they do come they may furnish a basis for work which will continue for years or even for a lifetime. The best way to find such suggestions is, first of all, to put ourselves in contact with some of the greatest workers in our science, either as their pupils or by studying their published papers. There is a sort of heredity in science which is more important even than physical inheritance. Liebig worked with Gay Lussac, Kekulè worked with Liebig, Baeyer worked with Kekulè, and Professor Nef and Professor Stieglitz of Chicago worked with Baeyer. Students working with Professor Stieglitz are only the fourth generation from Liebig.

A second source for suggestions is contact with our colleagues in scientific meetings or through their publications. A third is the study of the foundations of science in the endeavor to impart them to others.

The next prerequisite for successful research is that we shall seize on suggestions which are really worth while. We sometimes hear expressions which seem to imply that it is worth while to gather a lot of observations without any hypothesis to guide us simply because the facts recorded may prove of value later. Such persons seem to be afraid that if they use a hypothesis to guide them they will be biased in their judgment. They forget that facts are usually of very little value until they are brought into relationships by some hypothesis or theory.

Sir J. J. Thompson has put this well in his discussion of the electron theory. He says, "The theory is not an ultimate one, its object is physical rather than metaphysical. From the point of view of the physicist, a theory of matter is a policy rather than a creed. Its object is to connect or coordinate apparently diverse phenomena and above all to suggest, stimulate, and direct experiments. It ought to furnish a compass which, if followed, will lead the explorer further and further into unexplored regions. Whether these regions will be barren or fertile, experience alone will decide; but, at any rate, one who is guided in this way will travel on in a definite direction and will not wander aimlessly to and fro."

After the suitable topic has been found, there comes, I think, the most severe test of whether an individual will continue in a career of productive research or not—the test of staying power. It is here that a large majority of our young men and women trained in research fail. The conditions under which a young man or woman who has recently taken a Master's degree or the degree of Doctor of Philosophy works are often not very conducive to research. There is often a heavy burden of teaching and it is usually easy to spend all of one's working hours upon routine duties. Only the man who has a genuine enthusiasm for new knowledge is likely to meet these difficulties and overcome them. He must have faith in himself and in his work and he must often be content for years with accomplishments which do not seem very great either to himself or to others. As this world is now constituted he cannot be very certain either of financial returns or of fame. He must find his joy in the work itself and must see clearly that the most valuable things in life are not dollars and cents and what they will bring, nor even fame and the recognition of others, but rather the consciousness of genuine work well done. There must be a devotion to one's work that is very closely akin to the spirit of the old prophets. I know that some will say that this sort of idealism is not to be found in practical America. I am sure that this is not true; we have it here in our midst and it is a spirit that is contagious and will grow, though genuine prophets are always too few.

Some things can be more easily understood from concrete examples and at the risk of seeming personal I will sketch briefly the careers of two such prophets who have developed here in our midst. Ten years ago a young man who had graduated at Worcester Polytechnic and who had spent one year in graduate work at the Massachusetts Institute of Technology came here as a research assistant. Three years later he took his Doctor's degree and became an instructor in our organic division. After three years of intensive work both in teaching and research, Professor Curtiss, with whom he had been associated, left us and he was placed in charge of the division. After three years more the man in charge of one of the largest firms manufacturing dyes in America selected Doctor Derick to organize the research laboratory for his factory, not because of any technical experience but because he knew how to apply the principles of physical chemistry to organic problems and

because he was recognized as one of perhaps a dozen leading workers in organic chemistry in America.

Professor Balke graduated at Oberlin College and studied for his Doctor's degree with Edgar F. Smith of the University of Pennsylvania. Professor Smith has been the best representative in this country of that good old-fashioned work in inorganic chemistry which has been less cultivated in the world of late than it deserves to be. Doctor Balke came here in 1907 to take charge of our instruction in general inorganic chemistry. He soon began research work upon the rare earths. In the course of seven or eight years there were only one or two other men working in this particular field who could be considered his equal in America. Two or three years ago he spent a comparatively short time in work on an industrial problem for the Pfahnstiel Company of Chicago and was rather phenomenally successful. Last summer he was asked by that company to organize a research laboratory for the study of the application of rare elements to industrial uses. That laboratory is now actively at work on problems directly connected with the national defense and is taking two other men from us this summer.

These two men found the opportunity for research right here among us. It became necessary last summer to search the country over for men to fill their places and we discovered that the number of young men who have taken their degrees during the last ten years and who have devoted themselves steadily to research is very small. One of the positions left vacant has not been filled because we have not been able to find a man whom we considered altogether suitable to fill it. I cannot believe that there are not in this country a considerable number of men who have the natural ability to fill these positions if only they had been willing to pay the price—enthusiastic desire for new knowledge, steady, persistent work in the chosen field, and a willingness to forego many things which are desirable enough in themselves but which are impossible if genuine, high scholarship is to be attained. And so the word which I wish to say to you is: The next five or ten years of your life are the golden years. Do not feel that you can let one or two or three of them pass without beginning independent research of your own. If you do, the chances are very strong that, while I am sure that you will all do good work and work well worth doing, you will fail of the highest ideals for a scientific career.

HUMAN NATURE, THE QUARTERLY, AND SOME OTHER THINGS

EDWARD ELLERY

What is it in our human nature that prompts us to oppose, to object, and to criticize unfavorably, the moment any one of us proposes something new or different? It cannot be a voluntary and conscious act, inspired by a desire to accomplish some good for humanity, for the opposition arises spontaneously and with equal vehemence whether the thing started be good or evil. Can it be that we have in this phenomenon an exhibition of the same kind of "oppositeness" that is shown by a certain animal when you try to drive it through a gate? It makes no difference what the gate leads to—whether to a field filled with succulent roots or to a freight car billed to the packing house—you must expend a great deal of energy just to get the thing through. Let a man propose a new building, or a bridge, or a railroad, or a new kind of transportation, a new course of study, a new civil law, or even a new periodical—it does not make any difference what it is, if it is new or different, objectors arise in all quarters where before there were no objectors. With unanimous, although unpremeditated assent, they begin their "it can't be done" or "why try it" or "things are good enough as they are." If the proposer persists and accomplishes what he had in mind, the objectors are by no means silenced. They change their base. "Why did you not do it this way—any way but the way you did accomplish it." Our life is full of instances of this sort of phenomenon. It is said the Great Eastern carried in its cabin on its first voyage a pamphlet which proved conclusively that a vessel of its size could never cross the ocean propelled by steam. There are engineers in New Orleans today who were satisfied a few years ago that tall buildings in that city were impossible on account of the marshy nature of the soil. I wonder what they think now when eating a tasty creole dinner in the New Grunewald Hotel, or when making purchases in the Maison Blanche. We seldom hear any objector acknowledging that he was mistaken; at least if he does, his acknowledgment is not so loud as his previous opposition. It is a cause for congratulation that men have gone ahead with their purposes and have accomplished great good for the human kind in the

face of opposition, sometimes because they are like that brickmaker who was the first to wet his straw before mixing it with clay and of whom it was afterward said, "the blame fool didn't know it couldn't be done, so he went ahead and done it"; or sometimes because their convictions were based on a superior intelligent grasp of nature's law.

All this is apropos of suggestions that were made about the QUARTERLY at the New York convention. The New York Central Railroad deprived me of the advantages of the afternoon session by running one of its trains considerably behind time. But enough was said at the dinner to indicate that somebody thinks the QUARTERLY ought to suspend publication. Doubtless somebody has what appear to him to be good reasons for his conclusion, but I have been asking "Why?" ever since the convention. What has the QUARTERLY done that warrants the suggestion? What has it left undone? There are so many reasons why it should be continued, why we should all congratulate those who began it and are conducting it, and why we should help its editors, that I am constrained to make this appeal to the Society at large "to do its bit," not only in supporting the QUARTERLY but in expanding its usefulness.

Sigma Xi is an unusual society in membership and purposes. It welds together men of widely varying interests, men whose fields of work apparently lie far apart. Every one of us is doubtless deluged with the literature of his special line, devotes all his energy to his own limited realm, and attends conventions of men who have like interests. That is all very valuable, but it deepens rather than broadens one's knowledge. We all know there are other fields and other workers, but it is a kind of subconscious knowledge. It is a fine thing to have that knowledge brought to the surface occasionally—say five times a year—four times by the QUARTERLY and once by the convention. The more frequently we think of workers with other interests than our own, and the more intimate glimpse we can get of the results of their work, the more convinced we become that we are all approaching the same goal, albeit by different paths. We all have two things in common, namely, we recognize the tremendous value of a fact, and we know that the quality of mind and of energy expended in uncovering a fact is the same whatever the field of work. This is our bond of brotherhood—we are "brothers in zealous research" in all realms. The QUARTERLY is a periodical reminder of brotherliness.

Not only have we a common interest, but we never can tell where two fields of work may touch, or where paths of research may cross. At first thought not much connection appears between the chemical researches of Dr. W. R. Whitney and the biological investigations of Dr. Jacques Loeb. The application of X-rays to medical diagnosis and treatment, and the possible future application to sterilizing and preserving food stuffs, are some of the places where the fields of work of these two great men touch. The problem of deciding the origin of the worlds is not the exclusive task of the astronomer, nor that of fixing the age of our old earth a question for geologists alone. The chemist will assist both by finding a few more answers to questions about radium and its disintegration products.

Any means of banding together all the great workers in science is well worth fostering. It is not enough to honor such by election to Sigma Xi. It is good to remind such of their connection with the Society. The QUARTERLY is a periodical reminder of the real existence of the Society and of the close proximity of all fields of work represented in its membership.

All of us have a lively interest in the activities of the various circles of scientific workers who constitute the chapters of Sigma Xi, now scattered over the entire country. The QUARTERLY feeds that interest. It is not fed at the convention. There are too many other things going on at the time of our convention to make possible more than merely hasty greetings among the delegates. We squeeze the Sigma Xi convention into a program already full to suffocation. In some respects it would be better if we had an independent convention, where attention and energy could be concentrated on Sigma Xi matters. But failing that, and even if we had such, the QUARTERLY brings us most interesting news from our thirty chapters. Such news is worth having. Here are many circles of enthusiastic men stimulating and inspiring young workers all over the country. They together constitute a splendid influence and promise much for the future of scientific research in the United States. Why should not each circle have the benefit of the experience and the success of every other circle? The QUARTERLY is a periodic news letter from our widely scattered chapters.

The QUARTERLY is not a perfect magazine. Neither our able editorial committee nor our secretary claims that it is. No piece of

work that anybody does is perfect; if it were the efforts of our scientific forbears would have left nothing for us to do. The QUARTERLY is not the *editor's* magazine. It is *our* magazine. We are responsible for it. Our help to make it better is eagerly sought and desired. If we object to the quality of the chapter reports, let each chapter improve its own reports. If we object to the kind of articles which appear in the QUARTERLY, let us submit better ones. There are enough of us to give snap and interest and helpfulness to the pages of the QUARTERLY. Why not do our bit? Far from objecting and criticizing and opposing, or from suggesting suspension of publication, we might all contribute a little effort to help our editorial committee. That sort of attitude would be of extreme scientific interest, because it would be a new phenomenon in the realm of human nature.

The University of Pennsylvania Chapter issues a card with the emblem of the Society engraved upon it giving the general program for the year's session, and sends a similar card with a special program for each meeting.

These announcements emphasize in dignified fashion the standing of the organization, and are worthy of imitation.

CHAPTER REPORTS

The Illinois Chapter

The item of most importance passed during the year 1915-1916 was in regard to certain standard requirements to be met by all nominees for membership. In final form these were adopted as follows:

Professors and Instructors, Non Residents and Graduates of more than Five Years Standing:—It is considered essential that persons in any one of the above classes shall have published the results of scientific research conducted by them, as a pre-requisite for election to the Sigma Xi Society; provided, however, that the publication of master's or doctor's theses shall not be considered as fulfilling this requirement.

All nominations must be accompanied by published papers, articles or books, submitted as evidence of the scientific attainments of the nominee, and the nominators should certify to their belief in the scientific value and originality of the publications submitted.

Resident Graduate Students:—Graduate students, to become eligible for election to the Sigma Xi Society, should have published the results of scientific research conducted by them, or should have the results of such work completed in manuscript, or they should have completed an acceptable thesis.

All nominations must be accompanied by publications, manuscript, thesis, or an abstract of the results set forth in the themes, submitted as evidence of the scientific attainments of the nominee, and the nominators should certify to the scientific value and originality of the publications or manuscripts submitted.

Undergraduate Students:—In general, the difficulty of estimating the degree of promise of scientific ability in undergraduate students is so great that the number of elections to this grade of membership should always be small. Nominators are urged to submit the names of only such students as give beyond all doubt, great promise of scientific activity, who have some actual accomplishment in research as evidence.

The program for the year consisted of the following addresses: On October 26, 1915, Recent Developments in the Manufacture of Gasoline, by Samuel Wilson Parr, M.S., of the Department of Chemistry. November 16, 1915, The Latest Method of Sewage Disposal, by Edward Bartow, Ph.D., of the Department of Chemistry. December 15, 1915, Smoke as a Source of Atmospheric Pollution, by William Freeman Myrick Goss, M.S., D.Eng., Dean of the College of Engineering. January 19, 1916, How Bacteria Get into Milk, by Martin John Prucha, Ph.D., of the Department of Dairy Husbandry. Financial Returns from Dairy Farming, by Frank Ashmore Pear-

son, B.S.A., of the College of Agriculture. February 18, 1916, Reception to the Illinois Academy of Science, with short addresses. March 15, 1916, Some Recent Applications of Mental Tests, by Guy Montrose Whipple, Ph.D., of the Department of Education. Orientation Problems and Methods, by Madison Bentley, B.S., Ph.D., of the Department of Psychology. Visual Rhythm, by Christian Alban Buchmich, Ph.D., of the Department of Psychology. April 26, 1916, From Puget Sound to Baker Lake; the Influences that Direct the Migration of the Red Salmon, by Henry Baldwin Ward, Ph.D., of the Department of Zoology. May 29, 1916, The Possibilities of Scientific Research in Agriculture, by Eugene Davenport, M.Agr., Sc.D., Dean of the College of Agriculture. The Possibilities for Research in the Biological Sciences, by Frank Lincoln Stevens, Ph.D., of the Department of Botany. The Possibilities for Research in the Physical Sciences, by Clarence George Derick, Ph.D., of the Department of Chemistry. The Possibilities for Research in Engineering, by Herbert Fisher Moore, B.S., M.M.E., of the Department of Mechanical Engineering. Initiation and election of officers.

The initiates for the year, and the thesis or main publication presented by the nominators for those elected to membership, were as follows:

FACULTY

FREDERICK HAYNES NEWELL, B.S., D.Eng.

Hydrography of the Arid Regions; Public Lands of the United States; Irrigation in the United States; Hawaii, its Natural Resources; Principles of Irrigation Engineering; numerous other papers.

GRADUATES

ANDREW JOHN ALBERT ANDERSON, M.S.
Theoretical and Applied Mechanics

The Effect of Length on the Properties of Reinforced Concrete Columns.

THEODORE ROLLY BALL, Ph.D. *Fellow in Chemistry*

The Constitution of Mixed Solutions of Sodium and Potassium Salts.

ARTHUR NORTON BENNETT, M.S. *Chemistry*

Arsenic in Filter Alum.

DON WARREN BISSELL, B.S. *Organic Chemistry*

The Preparation and Characterisation of Trimethylene Oxide.

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All nominations must be accompanied by published papers, articles or books, submitted as evidence of the scientific attainments of the nominee, and the nominators should certify to their belief in the scientific value and originality of the publications submitted.

Resident Graduate Students:—Graduate students, to become eligible for election to the Sigma Xi Society, should have published the results of scientific research conducted by them, or should have the results of such work completed in manuscript, or they should have completed an acceptable thesis.

All nominations must be accompanied by publications, manuscript, thesis, or an abstract of the results set forth in the themes, submitted as evidence of the scientific attainments of the nominee, and the nominators should certify to the scientific value and originality of the publications or manuscripts submitted.

Undergraduate Students:—In general, the difficulty of estimating the degree of promise of scientific ability in undergraduate students is so great that the number of elections to this grade of membership should always be small. Nominators are urged to submit the names of only such students as give beyond all doubt, great promise of scientific activity, who have some actual accomplishment in research as evidence.

The program for the year consisted of the following addresses:

On October 26, 1915, Recent Developments in the Manufacture of Gasoline, by Samuel Wilson Parr, M.S., of the Department of Chemistry. November 16, 1915, The Latest Method of Sewage Disposal, by Edward Bartow, Ph.D., of the Department of Chemistry. December 15, 1915, Smoke as a Source of Atmospheric Pollution, by William Freeman Myrick Goss, M.S., D.Eng., Dean of the College of Engineering. January 19, 1916, How Bacteria Get into Milk, by Martin John Prucha, Ph.D., of the Department of Dairy Husbandry. Financial Returns from Dairy Farming, by Frank Ashmore Pear-

son, B.S.A., of the College of Agriculture. February 18, 1916, Reception to the Illinois Academy of Science, with short addresses. March 15, 1916, Some Recent Applications of Mental Tests, by Guy Montrose Whipple, Ph.D., of the Department of Education. Orientation Problems and Methods, by Madison Bentley, B.S., Ph.D., of the Department of Psychology. Visual Rhythm, by Christian Alban Buchmich, Ph.D., of the Department of Psychology. April 26, 1916, From Puget Sound to Baker Lake; the Influences that Direct the Migration of the Red Salmon, by Henry Baldwin Ward, Ph.D., of the Department of Zoology. May 29, 1916, The Possibilities of Scientific Research in Agriculture, by Eugene Davenport, M.Agr., Sc.D., Dean of the College of Agriculture. The Possibilities for Research in the Biological Sciences, by Frank Lincoln Stevens, Ph.D., of the Department of Botany. The Possibilities for Research in the Physical Sciences, by Clarence George Derick, Ph.D., of the Department of Chemistry. The Possibilities for Research in Engineering, by Herbert Fisher Moore, B.S., M.M.E., of the Department of Mechanical Engineering. Initiation and election of officers.

The initiates for the year, and the thesis or main publication presented by the nominators for those elected to membership, were as follows:

FACULTY

FREDERICK HAYNES NEWELL, B.S., D.Eng.

Hydrography of the Arid Regions; Public Lands of the United States; Irrigation in the United States; Hawaii, its Natural Resources; Principles of Irrigation Engineering; numerous other papers.

GRADUATES

ANDREW JOHN ALBERT ANDERSON, M.S.

Theoretical and Applied Mechanics

The Effect of Length on the Properties of Reinforced Concrete Columns.

THEODORE ROLLY BALL, Ph.D. *Fellow in Chemistry*

The Constitution of Mixed Solutions of Sodium and Potassium Salts.

ARTHUR NORTON BENNETT, M.S. *Chemistry*

Arsenic in Filter Alum.

DON WARREN BISSELL, B.S. *Organic Chemistry*

The Preparation and Characterisation of Trimethylene Oxide.

JOSEPH MARVIN BRAHAM, M.S. *Physiological Chemistry*
A Determination of the Freezing-point-Solubility Curve for the System Mannite-Water.

CARL SHIPMAN BREESE, B.S. *Electrical Engineering*
The Corona in Hydrogen; The Rectification of Alternating Currents.

HELEN CLARK, Ph.D. *Psychology*
The Relation of Image to Organic Movement; The Crowd; A Suggested Coefficient of Affective Sensitiveness.

ARTHUR REUBEN COOPER *Fellow in Zoology*
On the Systematic Position of *Haplobothrium globuliforme;* A New Cestode from *Amia calva* L.

SYLVAN J. CROOKER *Fellow in Physics*
Experimental Studies of Oscillatory Currents; The Surface Conditions of Wires Affecting the Corona.

JASPER OWEN DRAFFIN, B.S. *Research Fellow in T. and A. M.*
The Properties of Reinforced Concrete Columns and Eccentric Loading.

EDGAR WALLACE ENGLE *Fellow in Chemistry*
Investigations on the Rare Earths; Preparation of Pure Dysprosium Salts.

DUANE TAYLOR ENGLIS, A.M. *Chemistry*
A Study of the Chemistry of Liquid Manure.

ARTHUR WALTER GATWARD, B.S. *Electrical Engineering*
Magnetic Testing and Its Application to Iron of High Permeability.

BESSIE ROSE GREEN, A.M. *Zoology*
Description of a New Species of Polytoreutus.

CLYDE CARNEY HAMILTON, B.S. *Entomology*
The Classification of the Larvae of Ground Beetles.

WILLIAM DURRELL HATFIELD, B.S. *Chemistry*
Fertilizer Value of Activated Sludge.

MINNA ERNESTINE JEWELL, A.M. *Zoology*
A New Cestode from the Cricket Frog.

TANE KAWANOTA, B.S. *Electrical Engineering*
The Characteristics of Ignition Magnetos; Gas Engine Ignition.

JAMES ERNEST KINDRED, A.M. *Zoology*
The Lateral Line Organs of Amiurus.

HARRY FLETCHER LEWIS, M.S. *Organic Chemistry*
The Hydrolysis of Nitrobenzine; Studies on Alkaloidal Salts.

THOMAS BYRD MAGATH, M.S. *Zoology*
Nematode Parasites of North American Fresh-Water Fishes.

HENRY GUSTAV MAY, B.S. *Zoology*

The Life History and Development of the Hair-Snake Gordius.

WILLIAM ALGERNON KINGSNULL MORKEL, B.S. *Animal Husbandry*

Corn Silage and Its Relation to Beef Production.

ANNA G. NEWELL *Entomology*

The Comparative Morphology of the Genitalia of Insects.

EDWIN BOOTH POWERS, A.B., M.S. *Zoology*

A Determination of the Oxygen Requirements of Crayfishes with a View of Determining Their Suitability as Index Organisms; Reactions of Crayfishes to Gradients of Dissolved CO_2, and Acetic and Hydrochloric Acids; An Experimental Study of the Movements of Herring and Other Marine Fishes.

DEETE ROLFE, A.M. *History*

Physiography of Champaign County; Geologic Influences in the Economic Development of the Pennsylvania Piedmont Plateau; A Laboratory Guide in Physiography for Use in the Illinois Schools; Environmental Influences in the History of Ancient Egypt; The Suez Canal.

JOHN CARL ROSS, M.S. *Animal Nutrition*

The Study of the Amino Acid Contents of Corn, Wheat, Skim Milk, and the Interpretation of Feeding Experiments with Swine in Terms of the Amino Acid Contents of the Rations; The Quantitative Determination of the Amino Acids of Feeding Stuffs by the Van Slyke Method.

WARREN RIPPEY SCHOONOVER, B.S. *Agronomy*

The Effect of Curing on the Rate of Decomposition of Clovertops in Soil.

GLENN SEYMOUR SKINNER, A.M. *Chemistry*

Molecular Rearrangements in the Camphor Series, and the Decomposition Products in the Methylester of Isocamphoric Acid.

ERNEST HENRY VOLLWEILER, A.B. *Chemistry*

The Action of Metallic Oxides on Trimethylene Halides; The Use of Trimethlene Oxide in the Gregnard Reaction; The Preparation of Normal Primary Hexyl Alcohol.

HENRY JOSEPH WEILAND, B.S. *Chemistry*

The Conductivity of Extremely Dilute Solutions of Electrolytes; Hydrogen Sulphide in the Well-Waters of Chicago and Vicinity.

JAMES WILBUR WHISENAND, B.S. *Animal Husbandry*

Causes for Recent Changes in Number of Beef Cattle in Corn Belt.

ESTHER YOUNG, A.M. *Botany*

Studies of the Development of the Perithecia of the Microthyriaceae; Studies in Porto Rican Fungi.

EVERET GILLHAM YOUNG, B.S. *Railway Mechanical Engineering*

Some Factors Affecting Locomotive Tractor Effort.

JOSEPH ROSSITER ZIESENHEIM, B.S. *Animal Nutrition*
The Physical and Economic Basis upon Which the Live Stock Industry of the United States Rests; The Relation of the Market Receipts of Hogs to the Price per Pound Live Weight; A Compilation of American Digestion Experiments.

UNDERGRADUATES

SIDNEY DALE KIRKPATRICK, B.S. *Chemistry*
A Study of the Equilibrium in the Freedel and Craft Reaction.

CHESTER WILLIAM LENZING, B.S. *Chemistry*
Effect of Gashouse Waste upon Organic Matter in Streams.

ADOLPH LINCOLN NELSON, B.S. *Electrical Engineering*
Automobile Cam Design.

HORACE ABBOT SHONLE, B.S. *Chemistry*
On the Esterification of Amino Acids; On the Origin of Nitrates in Urine.

WALTER JOSEPH TILTON, B.S. *Chemistry*
A Rapid Method for the Analysis of the $R_2 O_3$ Precipitate Obtained in the Silicate Rocks.

GEORGE ALFRED WRISLEY, B.S. *Chemistry*
Comments on the Krebitz Process of Soap Manufacture and Glycosol Recovery.

The only business of general interest transacted by the Chapter during the year 1916-1917 was with reference to the QUARTERLY. In reply to a letter from President Julius Stieglitz asking for suggestions, a committee was appointed, which reported the following:

The displayed matter in the QUARTERLY should be set in smaller type and more compactly, and tables of statistics should contain no details but only totals of interest. Space saved in this way should be used to print more addresses delivered before chapters of the society.

A committee was also appointed to report at the first meeting in the fall on amendments to the by-laws which would provide for the election of associate members to the society.

The programs for the year were as follows:

On October 25, 1916, A Direct Method of Determining the Mass of the Electron in Metals, by Richard Chace Tollman, Ph.D. November 29, 1916, The Reclamation Process of the United States, by Frederick Haynes Newell, D.Eng. December 13, 1916, Some Phases of the Problem of Sex-Determination, by Charles Zeleny, Ph.D. January 17, 1917, The Provision Made by Mathematics for the Needs of Science, by Robert Daniel Carmichael, Ph.D. Febru-

ary 14, 1917, symposium on Thermodynamics, by Jacob Kunz, Ph.D., George Alfred Goodenough, M.E., and Edward Wight Washburn, Ph.D. March 14, 1917, Geological Field Work in the Minnesota Lake Region during the Summer of 1916, by Merle Louis Nebel, M.S. April 25, 1917, Some Physiological Problems in the Life Histories of Insect Pests and Other Animals of Economic Importance, by Victor Ernest Shelford, Ph.D. May 14, 1917, Whirlwinds and Sunspots, the annual joint address before Sigma Xi and Phi Beta Kappa, by George Ellery Hale of the National Research Council. May 30, 1917, presidential address to the initiates, by William Albert Noyes, Ph.D., LL.D.

The initiates for the year, with the thesis or the main publication presented by the nominators for those elected to membership, were as follows:

FACULTY

CULLEN WARNER PARMELEE, B.S. *Ceramic Engineering*
The Action of Phosphoric Acid in Body Mixtures; A Note on Terra Cotta Glazes; Some Notes on the Mechanical Analysis of Clays; The Production of Black Spots on Terra Cotta Glazes; Talc as a Body Material; Data on the Effect of Varying Compression Loads Applied to Clay in the Plastic State; Data on the Effect of Varying Compression Loads Applied to a Dense Body; Fritted Leaded Glaze for Sanitary Wares. Co-author of a report on the Peat Deposits of Northern New Jersey.

FANNY COOK GATES, Ph.D.
Effect on Excited Radioactivity; On the Nature of Certain Radiation from the Sulphate of Quinine; The Conductivity of Air Due to the Sulphate of Quinine.

PHILLIP SHERIDAN BIEGLER, B.S. *Electrical Engineering*
Some Tests on Motor-Driven Deep Well Pumps. Devices for measuring water level and discharge of pumps.

JOHN WILLIAMS DAVIS, M.E. *Electrical Engineering*
Corona and Rectification in Hydrogen; AC and DC Corona in Hydrogen.

IRA WILLIAM FISK, M.S. *Electrical Engineering*
Some Tests on Deep Well Motor-driven Pumps; Devices for measuring water level and discharge of pumps.

B. SMITH HOPKINS, Ph.D. *Chemistry*
The Osmotic Pressure and the Depression of the Freezing Points of Solution of Glucose; The Purification and Atomic Weight of Yttrium.

GRADUATES (DOCTORS)

FRANCIS MARSH BALDWIN — *Zoology*
Pharyngeal Derivatives of Urodele Amphibia; Description of Chemical Elements; Diurnal Activity of Earthworms; Consumption of Oxygen by Certain Marine Animals.

SILAS ALONZO BRALEY — *Chemistry*
The Analysis of Complex Alloys of the Ni, Cu, Cr, Type; Heterogeneous Equilibria between Aqueous and Metallic Solutions; The Interaction of Mixed Salt Solutions and Liquid Amalgams.

EDWARD MARION AUGUSTUS CHANDLER — *Chemistry*
The Molecular Rearrangement of Carbon Compounds.

EUGENE MAXIMILIAN KARL GEILING — *Animal Nutrition*
The Nutritive Value of Casein; The Value of Agriculture in Time of War; The Nutritive Value of the Diamino Acids Occurring in Proteins for the Maintenance of Adult Mice.

THEODORE SPAFFORD HENRY — *Education*
Classroom Problems in the Education of Gifted Children.

RUTH HIGLEY — *Zoology*
The Morphology and Biology of Some Turbellaria from the Mississippi River Basin.

MORRIS JOHNSON KERNALL — *Zoology*
Studies on the Anatomy of the General Hymenolopsis and Aploparaksis.

JOSEPH KRAFKA, JR. — *Zoology*
A Key to the Families of Trichopterous Larvae; Morphology of the Head of the Trichopterous Larvae.

HARRY CLEVELAND KREMERS — *Chemistry*
Observations on the Rare Earths; The Purification and Atomic Weight of Dysprosium.

HERSCHEL THURMAN MANUEL — *Education*
A Study of Talent in Drawing; The Use of an Objective Scale for Grading Handwriting; The Variability in the Use of the Ayres Scale for Grading Handwriting.

EDWARD WICHERS — *Chemistry*
Observations on the Rare Earths; Purification of Erbium with Specific Reference to the Separation from Yttrium; The Atomic Weight of Erbium.

WILLIAM HAROLD WILSON — *Mathematics*
On a Certain General Class of Functional Equations.

GRADUATES (MASTERS)

WALTER SPURGEON BEACH — *Botany*
Fusarium Wilt of China Aster.

HARRY TYLER BOOTH *Physics*
An Acoustical Thermometer; Distortion of the Electrostatic Field in the Corona Discharge.

HILDA MARION CROLL *Household Science*
A Study of Sugar Tolerance in Women.

HAROLD FORDYCE CROOKS *Geology*
The Lower Paleozoic Stratigraphy of the Northern Peninsula of Michigan.

RHODA FAHNESTOCK *Household Science*
A Dietary Study of Urticaria.

CHARLES STEVER FAZEL *Physics*
Sensitive Quadrant Electrometers; Principle of Similitude.

HARRY RHEINHARDT FRITZ *Electrical Engineering*
The Effect of Stress on the Magnetic Properties of High Permeability Iron.

MARGUERITE GAUGER *Household Science*
An Intensive Dietary Study of Constipation.

GEORGE MARSH HIGGINS *Zoology*
Nasal Capsule of Amphibia.

CHARLES MORSE HUFFER *Mathematics*
Study of the Continuity of a Derivative Defined by the Law of the Mean.

LOUIS JORDAN *Chemistry*
Observations on the Rare Earths; A Study of Some Methods for the Extraction of Gadolinium.

WALTER GERALD KARR *Chemistry*
Studies on the Formation and Distribution of Urea and Uric Acid in Vertebrates.

ROBERT HILLS KINGMAN *Zoology*
Development and Structure of the Pineal Eye of Acanthias.

LOUIS J. LARSON *Theoretical and Applied Mechanics*
An Investigation of Web Reinforcement for Reinforced Concrete Beams.

ALVA ELISHA MCCOY *Agronomy*
Researches with Soils of Low Nitrifying Efficiency and with Nitrifying Bacteria.

LEE ELLIS MILES *Botany*
Porto Rican Plant Diseases.

RUTH ELIZA OKEY *Chemistry*
The Qualitative Identification of the Drugs Containing Emodin.

FRANK ERWIN RICHART *Theoretical and Applied Mechanics*
Statically Indeterminate Stresses in Stiff Frame Structures.

ERNEST WILFORD SEYSTER *Zoology*
The Effect of Temperature upon Facet Number in the Bar-Eye Mutant of Drusilla; The Digestive Tract of Hyrax.

STETFAN FUGTA TANABE *Physics*
Collapse of Tubes; A Comparison of the Kelvin Double Bridge and the Potentiometer Method of Measuring Low Resistances.

RICHARD LAWRENCE TEMPLIN *Theoretical and Applied Mechanics*
An Investigation of Hooped Aggregate in Compression.

BERNICE CORNELIA WAIT *Household Science*
A Study of Carbohydrates as Milk Modifiers.

EDWARD HARVEY WALWORTH *Agronomy*
Variation in Secondary Rootlets in Zea Maize and Other Cereals.

HARRY MONTGOMERY WEETER *Dairy Husbandry*
The Effect of Dilution Water on Bacterial Suspensions.

CAMILLO WEISS *Civil Engineering*
Stresses in Statically Indeterminate Structures; Wind Stresses in the Steel Frames of Office Buildings.

UNDERGRADUATES

LEON ADLER *Chemistry*
Hydrogen Overvoltage.

FREDERICK AUGUSTUS BROOKS *Electrical Engineering*
The Design of a New Type of Gas Engine.

IVAR NINUS HULTMAN *Chemistry*
Improvement in the Preparation of P-aminophenol and Some of Its Derivatives.

ADOLPH WALTER LANDSTROM *Chemistry*
Syntheses in the Naphthalene Series.

GEORGE STEWART MONROE *Chemistry*
Free Carbon in Tars.

HUBERT WATSON MOOR *Chemistry*
Preparation of Certain Cyclic Ethers and a Study of Their Constitutions.

PAUL ALBERT RAIBOURN *Electrical Engineering*
Theory of the Static Balancer.

HUMPHRY OLIVER SIEGMUND *Electrical Engineering*
The Design, Construction, and Test of a Direct Reading Engine Indicator.

FRANK HULICK TENDICK *Chemistry*
Petroleum Ether Extraction of Tars.

WALTER VALENTINE WIRTH *Chemistry*
Oxalyl Chloride as a Reagent in Organic Chemistry.

JAMES BYRNIE SHAW, *Secretary*

The Chicago Chapter

The year 1916 has been an unusually inspiring one for the Chicago Chapter. Seventy new members were added to our ranks during the last academic year; and with a start at our first meeting this autumn of the fifty-five new members whose names are given below, it looks as if we should run well over the century mark this year. This does not mean that our Chapter believes that numbers alone spell prosperity. There has been a distinct raising of our standard during the past years. Each and all of these new members are people who have published research or else have completed two years of graduate work and have research of undoubted value approaching completion. The mere starting of a research problem is not considered as qualification for membership.

Our speakers last year included President Harry Pratt Judson on the topic, The Work of the China Medical Board; Professor John Merle Coulter on Sex Cells in Plants; and Dr. Edward P. Hyde, Director Nela Research Laboratories, of the General Electric Company, on The Modern Attack on the Lighting Problem. Our first speaker this year was Professor George E. Hale, whose topic was The National Research Council. Mr. Hale is well known as the chairman of this body, and our Chapter was particularly interested since three of our members, Messrs. Michelson, Coulter, and Millikan, have been appointed to it by President Wilson. We expect to have Professor Mendel of Yale address us on Vitamines at our next meeting.

MEMBERS ELECTED NOVEMBER 22, 1916

Lester Aronberg — *Chemistry*
Structure of Spectrum Lines. Work on Radio-active Lead.

Arthur Laurence Bakke — *Botany*
Studies on the Transpiring Power of Plants, Journal of Ecology, 2: 145-173. The Index of Transpiring Power, Botanical Gazette, 60: 314-319. Bakke and Livingston, Physiological Researches, 3: 51-71.

Israel Albert Barnett — *Mathematics and Astronomy*
Problems in the Calculus of Variations Invariant under a Special Group.

Mabel Bishop — *Neurology*
Comparative Study of Cosmobia, Journal of Anatomy, VIII, 4. Teratological research with special reference to Nerves.

Fred Kenneth Branon — *Geography*
The Historical Geography of St. Louis (complete).

RALPH LYMAN BROWN — *Chemistry*
Molecular Rearrangements of Hydrazines.

JOHN THEODORE BUCHHOLZ — *Botany*
Embryology of Pinus.

GEORGE EMANUEL BURGET — *Physiology*
Experimental Thyroid Hyperplasia. Bacteriology of the Stomach.

EDNA FAY CAMPBELL — *Geography*
Historical Geography of the Lower Mississippi Valley.

PAUL ROBERTS CANNON — *Hygiene and Bacteriology*
A Rapid and Simple Indol Test, Journal of Bacteriology, 1: 535. Present subject of research: A Study of Agglutination.

CLARENCE HUNTLEY CHRISTMAN — *Chemistry*
Acetyl and Urethane Derivatives of the Lactones of Mannonic and Gluconic Acids.

GEORGE LINDENBERG CLARK — *Chemistry*
Ternary Salt Mixtures. Now working on the Thermal Decomposition of the Cobalt-Amines.

HENRY RUSSELL CURME — *Chemistry*
Starting research on Oxidation and Reduction.

EARL CLAUDIUS HAMILTON DAVIES — *Chemistry*
One year's work on The Relation between Emulsification and Interfacial Surface Tension.

MARGUERITE DAVIS — *Physiological Chemistry*
Studies in Nutrition published with Doctor McCallum at University of Wisconsin. Assistant in Biochemistry at University of Toronto, 1915-1916. Engaged in research now.

SHOAN MESUGO FUKUYA — *Psychology*
Research on Efficiency in Distribution of Attention in Mental Work.

VICTOR HUGO GOTTSCHALK — *Physics*
Nature of Ionization of an Atom by Alpha Rays E. M. F. of Mineral Sulphides, Economic Geology, 1911-1912.

ESTHER MAUD GREISHEIMER — *Physiological Chemistry*
Master's thesis: The Action of Sodium and Calcium Salts on Voluntary Muscle. Research in progress: A Study of the Effects of Rubidium Salts on Nerves.

WILLIAM MCMICKEN HANCHETT — *Anatomy*
Working on Congenital Hypertrophic Pyloric Stenosis and Diabetes Insipidus (not completed).

FABIAN MILLER KAMENSTINE — *Physics*
Theory of the Operation of a Non-synchronous Gap for Wireless Telegraphy.

MERVIN JOE KELLY *Physics*
A Search for Polyvalent Gaseous Ions.

OTTO KOPPIUS *Physics*
A Comparison of the Work Necessary to Remove an Electron from a Metal by the Thermionic and the Photoelectric Processes.

LADEMA MARY LANGDON *Botany*
An Anatomical Study of the Ray System of the White Oak.

LOUIS MELVIN LARSEN *Chemistry*
Dyes Derived from Diamino-phenol.

VAUGHAN MACCAUGHEY *Botany*
The Kalo in Hawaii; Seaweeds of Hawaii; Ocher Rain Forest; Precinctive Flora of Waianae Mountains; Forests of Hawaiian Islands; Food Plants of Ancient Hawaiians, etc.

JOHN ROBERT MARSHALL *Geology*
Field Studies for Canadian Geological Survey in the Rice Lake Gold Districts near Winnipeg.

CLARK OWEN MELICK *Hygiene and Bacteriology*
The Possibility of Typhoid Infection from Some Contaminated Vegetables. A Study of the Intestinal Group of Bacteria with Reference to Complement Fixations.

JACOB MEYER *Physiology*
Hunger in Fever.

LOUALLEN FREDERICK MILLER *Physics*
(Webnelt Interrupter) Current and E. M. F. Curves, Electrical World, Sept. and Oct., 1900; Physics Manual, 1904.

CLARENCE ADELBERT NASH *Chemistry*
Methyl Cyanide as a Solvent.

RALPH EMORY NELSON *Chemistry*
Molecular Rearrangements, with Ransom, Journal American Chemical Society. Present research: The Salt Effect in Saponification.

JOHN CHRISTIAN PETERSON *Psychology*
Research on Reasoning Processes. Lecturer on Organic Chemistry, University of Lausanne, Switzerland.

JEAN FELIX PICCARD *Chemistry*
Assistant Professor of Organic Chemistry.
Papers on Dimethyl Pyrene Colored Derivatives on Dyes, on Catalysis in Ber. d. Deutsch. Chem. Gesells. and Liebigs Annalen.

ROBERT SWANTON PLATT *Geography*
Special Studies in Geography of China. (Has spent one year in China since Bachelor's degree.)

MAURICE HOLMES REES — *Physiology*
A.M. University of Illinois, 1905; Effect of H and O H Ions on Paramecium, Biological Bulletin.

JULIUS MARIA RETINGER — *Chemistry*
Chemical investigations on amines in relation to pathological processes. Papers on Alloxantin, Hydrantin, and Formanilid. Papers on Dementia Precox, Abderhalden Reaction, etc.

EDWARD NOEL ROBERTS — *Chemistry*
Velocities of Saponification.

LATHROP EMERSON ROBERTS — *Chemistry*
The Lowering of the Freezing Point in Mixtures of Salts.

BEARDSLEY RUML — *Psychology*
Article in Psychological Review, 1916, on Correlative Formulae. Research on Selective Tests to Determine General Intellectual Ability.

MANDAYAM A. SAMPATHKUMARAN — *Botany*
Smut on Sorghum (accepted for Master's thesis).

RALPH ALANSON SAWYER — *Physics*
Vacuum Spectrometry of Electric Sparks.

BENJAMIN HERMANN SCHLOMOVITZ — *Physiology*
Three papers published in the American Journal of Physiology. (Awarded the first scholarship for research by Rush Medical College last spring.)

CHARLES ROSS SCHROYER — *Geology*
The Contact between the Mississippian and Pennsylvanian in S. E. Ohio.

WILLIAM BARNARD SHARP — *Bacteriology*
Bacteriology of Vaginitis, Journal Infantile Diseases, 1914. Present subject: Bacteriological passage through intestinal wall.

DAVID MELVILLE SMITH — *Mathematics*
Jacobi's Condition for the Problem of Lagrange in the Calculus of Variations.

LELAND JOHNSON STACY — *Physics*
The Viscosities of Mixed Gases by the Constant Deflection Method.

IRVING EMERSON STEWART — *Geology and Geography*
Studes in basin of former Lake Agassiz, Manitoba. Has spent two summers in field work, Canadian Geological Survey.

HERMAN VANCE TARTAR — *Chemistry*
Has published independently on Sulphides of Calcium and Potassium, and on Bitter Principle of Hops. Present research: The Structure of Murexide.

RAYMOND CHARLES THOMPSON — *Physiological Chemistry*
The Plant Food Requirements of Fruit Trees, Arkansas Agricultural

Experiment Station, Bulletin 123. Present research: Hydrolysis of Creatine.

WILLIAM DEGARMO TURNER — *Chemistry*
One year's work on The Diffusion and Effusion of Gases.

EARNEST CHARLES WATSON — *Physics*
Energy of Emission of Negative Electron under the Influence of Homogeneous X-Rays.

CHARLES EDWARD WATTS — *Chemical Pathology*
Present research: Cholesterol in Pathological Conditions.

WANDA WENIGER — *Botany*
Development of the Embryo Sac and Embryo in *Euphorbia preslii* and *E. splendens*, Botanical Gazette. Work in progress: Fertilization in Lilium.

RUTLEDGE THORNTON WILTBANK — *Psychology*
Research on Transfer of Training in Animals.

KIA-LOK YEN — *Physics*
Mobilities of Ions in the Neighborhood of the Spark Potential.

MEMBERS ELECTED FEBRUARY 2, 1917

HARVEY RAYMOND BASINGER — *Physiology*
The Control of Experimental Cretinism.

ALBERT WILLIAM BELLOMY — *Zoology*
Multiple Allelomorphism and Inheritance of Color Patterns in Tettigidea (submitted to Journal of Genetics).

CHARLES AARON CARY — *Chemistry*
Research on Molecular Rearrangements.

RALPH WORKS CHANEY — *Geology*
The Tertiary Plants of the Cascade Mountains. Fossil Evidence of the Age of the Salt Domes of Southern Texas.

EMORY HILL — *Pathology*
Five or six papers on Clinical Ophthalmology. Research in Neuropathology.

EDWIN POWELL HUBBLE — *Astrophysics*
Var. nebula N G C 2261, Astrophysical Journal, Oct., 1916.

GEORGE EVERETT MARSH — *Geology*
Various papers on electrical engineering in Electrical World, etc. Research: Igneous Rocks of Southwestern Texas.

SIEGFRIED MAURER — *Anatomy*
Research work in the Department of Anatomy, especially in Hypophysis.

HAROLD TUPPER MEAD — *Zoology*
On the So-called Intestinal Glands in *Necturus maculatus*, Transactions American Microscopical Society, Vol. 35, No. 2.

WILLIAM RAYMOND MEEKER — *Anatomy*
Research work in Embryology.

LEONARD MARION PEAIRS — *Zoology*
Relation of Temperature to Growth of Insects, New Hampshire Experiment Station, Bulletin 7.

LEVI STEPHEN SHIVELY — *Mathematics*
An application to Hellinger Integrals of a new definition of limit (1916). Now working on a new basis for the metric theory of consequences.

THOMAS MCNIDER SIMPSON, JR. — *Mathematics*
Comet Observations, Astronomical Journal, 1903. Comparison Stars for Variable Star Observations (now in press at Publishers of Lander McCormick Observatory). Now working on Theory of Space Curves.

CHI CHE WANG — *Chemistry*
Chinese Preserved Eggs—Pidan, Journal Biological Chemistry, 28: 125, with K. Blunt. Now working further on the eggs, both Chemistry and Bacteriology, and on Chinese edible birds' nests.

CLYDE FRANKLIN WATTS — *Anatomy*
Changes in Iodine Content of the Thyroid Gland following Changes in Blood Supply through Gland, American Journal of Physiology, Sept., 1915.

BENJAMIN HARRISON WILLIER — *Zoology*
Research in Internal Secretion in the Life of the Embryo with Special Reference to Thyroid.

MEMBERS ELECTED APRIL 27, 1917

WALTER WILEY DAVIS — *Geology*
Is studying Mississippian Drift Fauna from northern part of Chicago.

MINNA CAROLINE DENTON — *Physiology*
Loss in Food Substances by Cooking.

CARL ALBERT DRAGSTEDT — *Physiology*
The Toxemia of Intestinal Obstruction.

LESTER REYNOLD DRAGSTEDT — *Physiology*
The Rôle of Gastric Juice in the Chronicity of Gastric Ulcer, Journal American Medical Association, 1916. The Nature of the Toxemia of Intestinal Obstruction, Journal Experimental Medicine, 1917.

ALVIN GEORGE FOORD — *Pathology*
Research work on The Influence of Low Temperature on Injection. Instructing in Pathology.

WILLIAM DEPREZ INLOW — *Physiology*
Studies on Gastric Secretion.

ANDREW CONWAY IVY — *Physiology*
Influence of Water-Drinking on Gastric Secretion and Hunger.

AARON ELIAS KANTER — *Physiology*
Studies on the Stability of Secretion.

JESSIE HORTON KOESSLER — *Physiological Chemistry*
Anthracidal Substance in Serum of White Rats, 1906. Pseudo-diphtheria (with A. Hamilton). Studies in Scarlet Fever (with K. Koessler).

HARRY BARNEY LEVEY — *Physiology*
The Sympathetic Innervation of Skeletal Muscles.

MARION LEWIS — *Physiology*
Studies on Milk Secretion.

JAMES ELIJAH MCATEE — *Mathematics*
Dissertation: Modular Invariants.

KENNETH CHARLES MCMURRY — *Geography*
The Geographical Significance of the Swamp and Overflow Lands in Illinois.

JAMES TAYLOR RICHARDS — *Geology*
On Mathematical Short Cuts. One or two short publications while at Rensselaer. At present engaged upon experimental investigation to throw light upon the deformation of continental masses in the earth (with R. T. Chamberlin).

MARY MEDA RISING — *Chemistry*
Research with Professor Piccard on Preservation of Enzymes of Milk. Appointed to Fellowship for next year.

MARY LURA SHERRILL — *Chemistry*
Ph.D. candidate. Has started on research problems with Professor Stieglitz.

EARLE AUGUSTUS SPESSARD — *Botany*
Prothallia of Lycopodium in America, Botanical Gazette, Vol. 43, No. 1.

BINDIGANAVALE K. SREENIVASIENGAR — *Astronomy*
Gold-Medal recipient (Mathematics) 1899, Madras University; Gold-Medal recipient (Physiology) 1900, Madras University; Honorable Mention for efficiency in Physics 1904, Madras University. Member of Indian Mathematical Society; Associate Editor, Journal of Mathematical Society; Observer of Magnetic Survey of India, 1907-1908.

WALTER CARL TOEPELMANN — *Paleontology*
Paper with Mr. Mehl (Ph.D., University of Chicago) on Phytosaurs.

MARY ALMA WETTON *Chemistry*

Ph.D. candidate under Professor Piccard. Will be an Assistant next year.

By an amendment to the By-Laws adopted at the meeting of February 2, undergraduates may be elected to Associate Membership in the Society. On April 27 the following students were elected to this rank:

Ralph Liggett Evans
Leslie Hellerman
Edwin Theodore Johnson
Horace Lundh Olson
Hedwig Jacobina Stieglitz
Sidney Weisman
James McBrayer Sellers

HARVEY B. LEMON, *Secretary*

Including Chapter Reports received up to June 1, 1917.

CHAPTER OFFICERS

LIST FURNISHED BY THE CORRESPONDING SECRETARIES OF THE CHAPTERS

CHAPTER	PRESIDENT	VICE-PRESIDENT	REC. SECRETARY	COR. SECRETARY	TREASURER
Cornell	G. S. Hopkins	K. M. Wiegand	J. G. Pertsch, Jr.	James McMahon	O. A. Johannsen
Rensselaer	E. D. N. Schulte	J. B. Lincoln	C. H. Andros	E. F. Chillman	E. F. Chillman
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Iowa	J. N. Pearce	G. L. Houser	A. O. Thomas	G. L. Houser	M. C. Williams
Stanford	C. P. Tolman	A. W. Meyer	J. O. Snyder	J. O. Snyder	J. O. Snyder
California	C. B. Lipman	H. M. Evans	T. C. Burnett	Edmond O'Neill	A. C. Alvarez
Columbia	G. B. Pegram	J. K. Finch	W. W. Stifler	Wm. Campbell	W. W. Stifler
Chicago	C. J. Herrick	E. B. Frost	H. B. Lemon	H. B. Lemon	H. B. Lemon
Michigan	E. C. Case	A. M. Barrett	H. A. Gleason	H. A. Gleason	H. H. Higbie
Illinois	W. A. Noyes	G. A. Goodenough	J. B. Shaw	J. B. Shaw	H. J. Van Cleave
Case	F. H. Vose	D. T. Wilson	W. R. Veazey	W. R. Veazey	C. D. Hodgman
Indiana	F. Payne	R. R. Ramsey	M. E. Hufford	M. E. Hufford	W. M. Tucker
Missouri	D. H. Dolley	M. F. Miller	H. C. Rentschler		W. A. Tarr
Colorado	H. A. Curtis	R. D. Crawford	W. C. Huntington	W. C. Huntington	J. Henderson
Northwestern	A. J. Kendall	G. V. McCauley	H. A. Clark	W. L. Woodburn	L. J. Shaw
Syracuse	H. A. Peck	C. H. Richardson	C. I. Corp	H. A. Clark	F. F. Decker
Wisconsin	W. J. Meek	J. H. Mathews	H. L. Brakel	C. I. Corp	E. B. Fred
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Purdue	A. M. Kenyon	R. G. Dukes	R. B. Wiley	C. M. Smith	A. T. Wiancko
Washington Univ.	A. S. Langsdorf	G. T. Moore	C. H. Danforth		Le Roy McMaster
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Including Chapter Reports received up to June 1, 1917.

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SIGMA XI QUARTERLY

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The General Convention has instructed the Secretary to keep for chapters a supply of printed blanks as enumerated below. According to instructions these are to be forwarded to chapters under the following stipulations:

Membership Certificates, stamped with the great seal of the Society. In packages of fifty prepaid, on advance payment of $2.50 for each package.

Index Cards, on the condition that a duplicate set be sent for the general index of the Society maintained in the secretary's office. Gratis on demand.

Statistical Record Blanks, for submitting annual reports giving chapter officers, elections, and other statistical data. Gratis on demand.

Mailing Blanks, on which secretaries are requested to furnish once a year a correct list of mailing addresses of active members to be transmitted directly to the printer. Gratis on demand.

The mailing list should be sent to the General Secretary early in September and be valid for the academic year. The attention of secretaries is called to the fact that all changes of address or other correspondence concerning the QUARTERLY should be addressed to the General Secretary and not to the printing firm.

WANTED

Extra copies of the December, 1916, number. The secretary will be indebted for any copies which may be available in the different chapters, in order to increase the meager supply in his office resulting from the misunderstanding in regard to chapter mailing lists. Please send copies to Henry B. Ward, University of Illinois, Urbana.